

## Claims

What is claimed is:

1. A system for monitoring the etching of apertures in an alternating aperture phase shift mask, comprising:
  - one or more fabricating components operative to fabricate one or more mask features;
  - a fabricating component driving system operably connected to the one or more fabricating components, the fabricating component driving system operable to drive the one or more fabricating components;
  - a system for directing light on to at least one of the one or more features; and
  - a measuring system for measuring feature parameters based on a light reflected and/or refracted from the one or more features.
2. The system of claim 1, comprising a processor operatively coupled to the measuring system and the fabricating component driving system.
3. The system of claim 2 where the processor is adapted to receive feature data from the measuring system and to at least partially control the one or more fabricating components to regulate fabricating the one or more features.
4. The system of claim 3 where the fabricating components are etching components.
5. The system of claim 4 where the features comprise at least one of an aperture and a grating.
6. The system of claim 3 where the measuring system comprises a scatterometry system for processing the light reflected from the one or more features.

7. The system of claim 6 where the fabricating components are etching components.

8. The system of claim 7 where the features comprise at least one of an aperture and a grating.

9. The system of claim 6 where the processor maps the mask into a plurality of grid blocks and makes a determination of fabrication conditions at the one or more grid blocks.

10. The system of claim 9, where the fabrication conditions comprise at least one of the depth, width and profile of the features.

11. The system of claim 10 where the processor determines the existence of an unacceptable fabrication condition for the one or more features based upon a determined feature signature differing from an acceptable feature signature.

12. The system of claim 10 where the processor controls the one or more fabricating components to regulate fabricating the one or more features on the mask.

13. The system of claim 12 where the features comprise at least one of an aperture and a grating.

14. The system of claim 13 where the fabricating components are etching components.

15. A system for monitoring the profile of an aperture on an alternating aperture phase shift mask, the system comprising:  
a system for directing light onto an alternating aperture phase shift mask; and  
a measuring system for measuring one or more aperture parameters based on a light reflected from the aperture.

16. The system of claim 15 where the aperture parameters comprise at least one of aperture depth, aperture width and aperture wall slope.

17. The system of claim 16 comprising a processor adapted to receive aperture data from the measuring system and to facilitate determining whether the alternating aperture phase shift mask has been fabricated within one or more pre-determined tolerances.

18. The system of claim 17 where the pre-determined tolerances comprise at least one of aperture depth, aperture width and aperture wall slope.

19. The system of claim 18 where the measuring system comprises a scatterometry system for processing the light reflected from an aperture to determine an aperture signature.

20. The system of claim 19 where the processor determines whether the mask has been fabricated within one or more pre-determined tolerances based upon a determined aperture signature differing from an acceptable aperture signature.

21. A method for monitoring and controlling aperture etching in an alternating aperture phase shift mask, comprising:  
etching one or more apertures on the alternating aperture phase shift mask;  
directing light onto at least one of the one or more apertures;  
collecting light reflected from the at least one aperture;  
employing scatterometry to analyze the reflected light to determine at least one of the depth, shape, location, profile and width of the at least one aperture; and  
selectively controlling the etching of the one or more apertures in the mask.

22. The method of claim 21 comprising:  
etching one or more gratings on the alternating aperture phase shift mask;  
directing light onto at least one of the one or more gratings;  
collecting light reflected from the at least one grating; and

employing scatterometry to analyze the reflected light to determine at least one of the depth, shape, location, profile and width of the at least one grating.

23. A method for determining whether an alternating aperture phase shift mask has been fabricated with desired aperture etching parameters, comprising:

etching one or more apertures on the alternating aperture phase shift mask;

directing light onto at least one of the one or more apertures;

collecting light reflected from the at least one aperture;

employing scatterometry to analyze the reflected light to determine at least one of the depth, shape, location, profile and width of the at least one aperture; and

determining the acceptability of the alternating aperture phase shift mask based on at least one of the depth, shape, location, profile and width of the at least one aperture.

24. The method of claim 23 comprising:

etching one or more gratings on the alternating aperture phase shift mask;

directing light onto at least one of the one or more gratings;

collecting light reflected from the at least one grating; and

employing scatterometry to analyze the reflected light to determine at least one of the depth, shape, location, profile and width of the at least one grating.

25. A system for controlling a process for etching openings in an alternating aperture phase shift mask, comprising:

means for sensing at least one of the shape, location, depth, width and opening wall slopes of one or more apertures on the mask;

means for etching one or more apertures on the mask; and

means for selectively controlling the etching of the one or more apertures based on analysis of data collected by the means for sensing the shape, location, depth, width and opening wall slopes of the one or more apertures.